Student Learning Expectations and Benchmarks

Science–Grade K

Catholic Social Teaching

In keeping with the mission of the Catholic school, teachers will infuse Catholic Social Teaching into lessons and assist students in applying this teaching in a developmentally appropriate manner. To facilitate this, we have included a brief statement of each principle that grounds the teaching. The statements are paraphrased from *Sharing Catholic Social Teaching Challenges and Directions* published by the United States Catholic Conference, 1998.

Principles of Catholic Social Teaching

- Each person is sacred.
- Each person is social.
- We care for creation.
- All people have rights and responsibilities.
- We take care of the poor and vulnerable.
- Workers have rights; work has dignity.
- Solidarity is our call; we are the keepers of our brothers and sisters.

Content and Principles–Grade K

1 The student understands and uses scientific concepts and principles

Physical Science

The student will:	SCI EALR 1
<u>Properties of Objects and Materials</u>	
■ Identify observable properties, such as size, weight, color, shape and texture	1.1
■ Know the difference between solid materials and liquid materials	
■ Identify and describe differences between natural and manufactured objects	
■ understand that objects, materials and organisms can undergo physical changes	1.2
<u>Motion and Forces</u>	
■ Explore concepts of magnitude and distance (e.g., fast/slow, big/little, near/far, short/long)	1.1
■ Recognize that there are a variety of ways to make things move	1.3
<u>Waves and Energy</u>	
■ Demonstrate different ways to produce sound	1.1
■ Relate light, sound and heat with the senses of sight, hearing and touch	1.2
■ Identify different sources of energy in their classroom and home	
<u>Systems</u>	
■ Know that most things are made of parts	1.2
■ Observe and describe changes in a simple system (e.g., plant terrarium, ant farm, aquarium)	

Content and Principles–Grade K

Earth and Space Science

The student will:	SCI EALR 1
Geosphere	
■ observe and examine different rocks–compare properties such as size and shape	1.1
■ know that change is something that happens to many things	1.3
Hydrosphere and Atmosphere	
■ observe weather changes from day-to-day and season to season, using descriptive terms to record data (rain/dry, cloudy/clear, etc.)	1.3
Solar System and Universe	
■ observe and describe the sky at different times of the day and month	1.2

Life Science

The student will:	SCI EALR 1
Structure and Function	
■ identify and describe differences between living and non-living things	1.1
■ identify observable similarities and differences among diverse species	
Populations and Ecosystems	
■ describe the basic needs of living organisms for survival	1.3
■ identify different ways the five senses help humans and other organisms in their environment	
■ explore ways in which organisms and objects react to changing conditions around them	
■ know how to care appropriately for living organisms in the classroom or at home	

Scientific Inquiry–Grade K

2 The student knows and applies the skills and processes of science and technology

Questioning

The student will:

- ask questions about the world around them

SCI EALR 2

2.1

Designing and Conducting Investigations

The student will:

- plan and conduct careful observations to answer a question
- gather data by describing, counting and tallying (*Math)
- follow safety rules and directions carefully; safe procedures should include the use and care of simple technology and of living organisms in the classroom
- use simple tools such as a magnifying lens to extend the senses in investigations
- perform simple measurements and comparisons (bigger/smaller, heavier/lighter)
- repeat observations at different times and places

SCI EALR 2

2.1

Explaining

The student will:

- display data using object and pictorial graphs and tables (*Math)
- describe things as accurately as possible and without exaggeration
- describe a given object or organism in such detail that another learner may identify the object or organism from the description[2]

SCI EALR 2

2.1

Modeling

The student will:

- draw pictures that correctly portray at least part of an object being described
- use simple materials such as paper and clay to construct a model of an object

SCI EALR 2

2.1

Scientific Inquiry–Grade K

Communicating

The student will:

- communicate observations and comparisons through various means such as pictographs, pictures, models and words[3]
- be able to tell others about their own observations, including what they think and what it makes them wonder about

SCI EALR 2

2.1

Science in the Social Context–Grade K

3 The student understands the nature and context of science and technology

Science as a Human Endeavor

The student will:

- know that everybody can do science and invent things and ideas
- give examples of how diverse people participate in science

SCI EALR 3

3.2

Science and Technology in Society

The student will:

- explore the recycling of objects in their environment
- demonstrate the proper use of simple technology

SCI EALR 3

3.2

Student Learning Expectations and Benchmarks

Science–Grade 1

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Content and Principles–Grade 1

1 The student understands and uses scientific concepts and principles

Physical Science

The student will:	SCI EALR 1
Properties of Objects and Materials	
■ objects are made of one or more materials	1.1
■ know that some properties of objects can be measured by using tools (i.e. ruler, scale)	
■ categorize objects into two groups–natural and manufactured	
■ observe that some materials, such as water, can be a liquid or a solid and can go back and forth between the two	1.2
■ observe and describe physical changes in different situations	
Motion and Forces	
■ describe the motion of one object relative to another object	1.1
■ observe that the way to change how something is moving is to give it a push or pull	1.3
Waves and Energy	
■ understand that sound is produced by vibrating objects	1.1
■ demonstrate that light, heat, magnetism, and sound can cause changes	1.2
■ know that people burn fuels (wood, oil, coal or natural gas) or use electricity to cook and heat	
■ observe that magnets can be used to make things move without touching them	
■ know that magnets can attract some materials but not others	
Systems	
■ identify some of the parts of a given object	1.2
■ observe that when parts are put together, they can do things they could not do by themselves	

Content and Principles–Grade 1

Earth and Space Science

The student will:	**SCI EALR 1**
Geosphere	
■ sort and group different types of rocks, sand and minerals based on properties such as size, shape and color	1.1
■ observe and describe changes in the physical environment	1.3
Hydrosphere and Atmosphere	
■ know that weather can be described by measurable quantities such as temperature, wind direction and speed, and precipitation	1.3
■ recognize that some events, such as weather, have a repeating pattern	
Solar System and Universe	
■ know that objects in the sky have patterns of movement	1.3
■ observe that the moon's shape changes a little bit each night and looks the same again about every four weeks	

Life Science

The student will:	**SCI EALR 1**
Structure and Function	
■ given an object, determine whether it is living or non-living	1.1
■ sort a collection of objects or organisms into groups based on observable physical properties	
■ identify basic plant and animal structures	1.2
■ describe similarities and differences between different organisms	
Life Cycles, Reproduction and Heredity	
■ identify the stages of a life cycle	1.2
■ identify life-cycle stages in different organisms	
Populations and Ecosystems	
■ know that living things are found almost everywhere in the world	1.3
■ identify living and non-living components in a specific location	
■ know that animals rely on plants for food and shelter	

Scientific Inquiry–Grade 1

2 The student knows and applies the skills and processes of science and technology

Questioning

The student will:

SCI EALR 2

2.1

- ask questions about the world around them
- ask questions that can be answered by making careful observations
- presented with unfamiliar situations or phenomena, ask questions related to cause and effect
- given a simple question regarding natural phenomena, suggest several places to find information that may lead to answers to the questions

Designing and Conducting Investigations

The student will:

SCI EALR 2

2.1

- plan and conduct an investigation using systematic observation to answer a question
- make multiple observations of objects, organisms and events using the five senses
- gather data by describing, counting, tallying and measuring (*Math)
- identify and use common tools used to find measurements (*Math)
- follow safety rules and directions carefully
- use simple tools to aid in investigations
- repeat investigations at different times and places

Explaining

The student will:

SCI EALR 2

2.1

- display data using object and pictorial graphs and tables (*Math)
- describe things as accurately as possible using physical properties
- interpret information displayed in a picture or object graph using more, less, fewer, etc. (*Math)
- describe and compare things in terms of number, shape, texture, size, weight, color and motion

Scientific Inquiry–Grade 1

Modeling

The student will:

- draw pictures that correctly portray at least part of an object or organism being described
- construct physical models illustrating objects or simple concepts from common materials
- use analogies to model an object or event

SCI EALR 2

2.1

Communicating

The student will:

- report observations using oral and written descriptions as well as pictures
- respectfully consider the ideas and impressions expressed about the nature of events by others[4]
- ask, “How do you know?” in response to appropriate situations and attempt reasonable answers when others ask the same question

SCI EALR 2

2.1

Science in the Social Context–Grade 1

3 The student understands the nature and context of science and technology

Nature of Science

The student will:

- know that science investigations generally work the same way in different places

SCI EALR 3

3.1

Science as a Human Endeavor

The student will:

- know that everybody can do science
- know that scientists often work in teams and share findings with others

SCI EALR 3

3.2

Science and Technology in Society

The student will:

- practice appropriate conservation of materials and waste disposal
- identify various technologies (e.g., paper clips, zippers, computers)
- provided with a familiar object, describe potential safe uses of the object
- know that tools help scientists make better observations, measurements and equipment for investigation

SCI EALR 3

3.2

Student Learning Expectations and Benchmarks

Science–Grade 2

Catholic Social Teaching

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Content and Principles–Grade 2

1 The student understands and uses scientific concepts and principles

Physical Science

The student will:

	SCI EALR 1
Properties of Objects and Materials	
■ use properties of objects to separate or sort a group of objects or materials	1.1
■ demonstrate that things can be done to materials to change some of their properties, but not all materials respond the same way to what is done to them	1.2
■ create mixtures (e.g., salt and sand, iron filings and soil) and separate them based on differences in their physical properties	
Motion and Forces	
■ describe the position of an object by locating it relative to another object or background	1.1
Waves and Energy	
■ understand how the pitch of sound can be changed	1.1
■ understand how echoes are produced	
■ understand how electricity passes from an electrical source to an object (i.e. lamp)	1.2
■ know that things that give off light also give off heat	
Systems	
■ identify most of the parts of an object	1.2
■ know that an object may not work properly if some parts are missing	
■ describe and record changes and patterns of change in a familiar system[5]	

Content and Principles–Grade 2

Earth and Space Science

The student will:	SCI EALR 1
Geosphere	
■ given different rocks, be able to describe similarities and differences	1.1
■ recognize the difference between a slow change and a rapid change	1.3
Hydrosphere and Atmosphere	
■ understand that water on earth can exist as a solid, liquid or gas	1.1
■ observe weather changes using measurable quantities (i.e. temperature, wind direction and speed, and precipitation)	1.3
■ describe seasonal weather patterns	
Solar System and Universe	
■ know that the sun warms the land, earth and water	1.3

Content and Principles–Grade 2

Life Science

The student will:

	SCI EALR 1
Structure and Function	
■ describe similarities and differences between plants and animals	1.1
■ describe the basic functions of plant and animal structures	1.2
■ know how basic plant and animal structures are important to an organism's survival	
■ identify the varied needs of living things and how living things meet their needs	1.3
Life Cycles, Reproduction and Heredity	
■ know that plants and animals closely resemble their parents	1.2
■ recognize that offspring within families have both similarities and differences	
■ identify life-cycle stages in different organisms	
Populations and Ecosystems	
■ know what an ecosystem is	1.3
■ describe populations, resources and environments (e.g., habitat, food chain)	
■ explore ways in which organisms or objects react to change	
■ describe the interaction of living and non-living components within an ecosystem	
■ identify cause-and-effect relationships in living systems (If.....then....)	
■ observe living organisms and make predictions related to their behavior or response to a stimulus	

Scientific Inquiry–Grade 2

2 The student knows and applies the skills and processes of science and technology

Questioning

The student will:

- ask questions about the world around them
- ask questions that can be answered by making careful observations and trying things out

SCI EALR 2

2.1

Designing and Conducting Investigations

The student will:

- understand that scientists use different kinds of investigations, such as describing, classifying and experimenting
- design and conduct a simple experiment to answer a question
- predict the results of an experiment
- use appropriate measuring tools in investigations, including rulers, thermometers and balances (*Math)
- follow safety rules and directions carefully
- repeat experiments several times to obtain consistent results
- use a variety of media to search for information

SCI EALR 2

2.1

Explaining

The student will:

- display data using simple tables and graphs (*Math)
- interpret information displayed in simple graphs using more, less, fewer, etc. (*Math)
- describe and compare objects and events with increasing accuracy, in terms of number, shape, texture, size, weight, color and motion

SCI EALR 2

2.1

Scientific Inquiry–Grade 2

Modeling

The student will:

- draw pictures that correctly portray an object, event or process
- use simple materials to construct a model of an object or event
- use analogies and metaphors to model an object or event
- compare a physical model to what it represents

SCI EALR 2

2.1

Communicating

The student will:

- report observations using oral and written descriptions as well as pictures
- restate, illustrate or summarize what others have said
- given the results of a simple investigation, suggest several new questions to investigate[6]
- ask, “How do you know?” in response to appropriate situations and attempt reasonable answers when others ask the same questions

SCI EALR 2

2.1

Science in the Social Context–Grade 2

3 The student understands the nature and context of science and technology

Nature of Science

The student will:

- explain how asking and answering questions are part of the process of scientific investigation
- understand that all scientific observations should be reported accurately even when they contradict expectations

SCI EALR 3

3.1

Science as a Human Endeavor

The student will:

- know that women and men of all ages, backgrounds, and groups engage in a variety of scientific and technological work
- know that women and men have made a variety of contributions throughout the history of science and technology
- read about ideas and inventions from a wide diversity of persons, cultures, and other choices
- read and write stories about famous men and women in science history

SCI EALR 3

3.2

Science and Technology in Society

The student will:

- describe how various technologies contribute to solving a problem
- describe similarities and differences in the use of technology in different cultures
- know that tools help scientists make better observations, measurements and equipment for investigation
- know that some objects occur in nature and that others have been designed and made by people to solve human problems and enhance the quality of life

SCI EALR 3

3.2

Student Learning Expectations and Benchmarks

Science–Grade 3

Catholic Social Teaching

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- Workers have rights; work has dignity.
- Solidarity is our call; we are the keepers of our brothers and sisters.

Content and Principles–Grade 3

1 The student understands and uses scientific concepts and principles

Physical Science

The student will:

SCI EALR 1

Properties of Objects and Materials

- create a simple classification system for a group of objects, based on their physical properties — 1.1
- demonstrate that when a anew material is made by combining two or more different materials, it has properties that are different from the original materials — 1.2
- demonstrate that the weight of the whole object is always the sum of its parts

Motion and Forces

- describe an object's motion by using tools (such as rulers and stopwatches) to measure its position over time — 1.1
- know that different objects vary greatly in speed
- know that the size of a change in speed or direction is related to the strength of the pull or push — 1.3

Waves and Energy

- observe what happens to a beam of light as it is directed toward nearby object, objects that are far away, mirrors, etc. — 1.1
- describe changes in the path of light in relation to different objects
- know that heat can be produced in many ways–burning, rubbing, mixing, or by machines — 1.2
- know that when something grows cold it loses heat–when something grows warm it gains heat
- know that electrical circuits require a complete loop through which and electric current can pass
- observe that magnets pull on all things made of iron and either push or pull on other magnets

Systems

- describe how parts of an object usually influence one another — 1.2
- identify parts of a familiar system (such as a bicycle, a park or a clock) and explain the relationships among the parts of the system
- describe the effect that one missing or broken part has on an entire system

Content and Principles–Grade 3

1 The student understands and uses scientific concepts and principles

Earth and Space Science

The student will:	SCI EALR 1
Geosphere	
■ know that rocks are composed of different combinations of minerals	1.1
■ understand that the earth has a mainly solid interior and a surface composed of different landforms	1.2
■ understand the factors that contribute to erosion and weathering	1.3
■ describe how erosion and weathering affect the earth's surface	
■ identify natural forces (e.g., water, ice, wind) that shape the earth's surface	
Hydrosphere and Atmosphere	
■ understand that the earth's surface includes bodies of water and an atmosphere	1.2
■ collect weather data and interpret changes in weather conditions	1.3
■ identify the seasons and their characteristics	
Solar System and Universe	
■ know that the earth is one of several spherical planets in our solar system	1.2
■ know that telescopes magnify the appearance and number of distant objects in the sky	1.3
■ recognize that pattern of stars in the sky stay the same although they appear to move across the sky nightly	

Content and Principles–Grade 3

Life Science

The student will:	SCI EALR 1
Structure and Function	
■ sort organisms into plant and animal groups based on observable characteristics	1.1
■ distinguish between living and non-living things when given a diverse collection of organisms and objects, and provide justification for this classification	
■ identify the basic body structure and internal organs of humans	1.2
Life Cycles, Reproduction and Heredity	
■ compare and contrast the life cycles of different organisms	1.2
■ know the difference between inherited traits and learned traits	
Populations and Ecosystems	
■ explain how specific populations, resources and environments interact	1.3
■ identify adaptations of plants and animals that allow them to live in a specific environment	
■ explain cause-and-effect relationships in living systems	
■ identify different ways that some organisms influence other organisms	

Scientific Inquiry–Grade 3

2 The student knows and applies the skills and processes of science and technology

Questioning

The student will:

- ask questions about objects, organisms, events and processes
- ask questions that can be answered through careful observations and simple experiments

SCI EALR 2

2.1

Designing and Conducting Investigations

The student will:

- design and conduct a simple experiment to answer a question
- keep a notebook that describes observations and is understandable; do not change information in notebooks after it has been recorded
- identify tools that would be appropriate for a given task
- predict the results of an experiment
- understand why it is important to follow all safety rules
- repeat experiments several times to obtain consistent results
- search for information from multiple sources

SCI EALR 2

2.1

Explaining

The student will:

- support conclusions and interpretations with analysis of the data (*Math)
- check explanations against scientific knowledge, experience and observations of others
- offer reasons for findings and consider reasons suggested by others

SCI EALR 2

2.1

Scientific Inquiry–Grade 3

Modeling

The student will:

- make sketches to aid in explaining procedures or ideas
- choose appropriate common materials for making simple mechanical construction
- construct a physical model of an object or event and compare the model to what it represents

SCI EALR 2

2.1

Communicating

The student will:

- understand that clear communication is an essential part of doing science
- use numerical data in describing and comparing objects and events (*Math)
- critique and analyze own work and work of other students–spoken, drawn or written
- seek better reasons for believing something than "I just know"[8]
- know that scientists review and ask questions about results of other scientists' work

SCI EALR 2

2.1

Problem Solving

The student will:

- identify a problem in which science/technology can be used to design solutions
- propose a solution to this problem
- design and perform an experiment to test a solution to an identified problem
- evaluate how well the proposed solution solved the problem

SCI EALR 2

2.2

Science in the Social Context–Grade 3

3 The student understands the nature and context of science and technology

Nature of Science

The student will:

- differentiate between questions that can be answered by science and those that cannot
- understand that all scientific observation should be reported accurately even when they contradict expectations
- know that scientific investigations take many different forms (e.g., observation, collecting, doing experiments)
- compare prior knowledge to the results of a scientific investigation
- know that science involves asking and answering a question and comparing answers to what is already known

SCI EALR 3

3.1

Science as a Human Endeavor

The student will:

- know that doing science involves many different kinds of work and engages everyone
- know that people continually invent new ways of doing things, solving problems and getting work done
- read and write stories about famous men and women in science history
- identify how math, science and technology are used in common occupations

SCI EALR 3

3.2

Science and Technology in Society

The student will:

- use scientific findings to propose and evaluate solutions to a problem (e.g., water pollution, fire hazards, garbage)
- understand the effects of solutions presented by new tools and techniques
- identify and describe how science and technology have improved food quality and quantity, transportation, health, sanitation and communication

SCI EALR 3

3.2

Student Learning Expectations and Benchmarks

Science–Grade 4

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Content and Principles–Grade 4

1 The student understands and uses scientific concepts and principles

Physical Science

The student will:

	SCI EALR 1
Properties of Objects and Materials	
■ describe how heating and cooling cause changes in properties of materials	1.2
■ identify and describe the different states of matter	
■ identify common physical and chemical properties	
■ know that materials may be composed of parts that are too small to be seen without magnification	
Motion and Forces	
■ understand the difference between natural forces (i.e. water, ice, wind) and manufactured forces (i.e. push or pull)	1.3
■ identify forces that can change the speed or direction of an object	
■ identify the relationship between the change in motion of an object and the size of the applied force	
Waves and Energy	
■ understand that different types of surfaces (transparent, opaque, reflective) affect a path of light differently	1.1
■ compare and contrast various types of energy sources	1.2
■ observe that when warmer things are put with cooler things, warm ones lose heat and cool ones gain heat until they are in equilibrium (conduction)	
■ describe how electrically charged materials interact with and influence other materials	
Systems	
■ describe how one part of an object depends on, and is influenced by, another part	1.2
■ design a model to illustrate a system	
■ identify the parts describe the functions of a subsystem within a system	

Content and Principles–Grade 4

Earth and Space Science

The student will:	SCI EALR 1
Geosphere	
■ describe how landslides, volcanic eruptions and earthquakes affect the earth's surface	1.3
■ understand how the properties of soil are important to maintaining life on earth	
Hydrosphere and Atmosphere	
■ describe what makes up the atmosphere	1.1
■ describe how air and wind are related	1.3
Solar System and Universe	
■ know that the rotation of earth on its axis produces day and night cycles	1.2
■ understand that the earth is one of several planets that orbits the sun	
■ understand that the moon orbits the earth	

Content and Principles–Grade 4

Life Science

The student will:	SCI EALR 1
Structure and Function	
■ construct a simple classification system based on physical characteristics of organisms	1.1
■ know that living things are composed of parts made of cells	1.2
■ identify the main structure of cells, tissues, and organs within an organism	
■ identify the functions of body systems (e.g., digestion, respiration, circulation)	
■ compare and contrast the diversity and scale of various organisms, including microorganisms	1.3
Life Cycles, Reproduction and Heredity	
■ compare and contrast reproduction of different organisms	1.2
Populations and Ecosystems	
■ describe the components of an ecosystem	1.3
■ describe how living and non-living components interact within an ecosystem	
■ understand why plants are essential to food chains in an ecosystem	
■ understand that for any particular environment, some kinds of organisms survive well, some less well, and some do not survive at all	
■ describe how humans depend on the natural environment	
Evolution, Diversity and Adaptation	
■ understand that fossils provide evidence about plants and animals that lived long ago and provide clues to what types of environment they had	1.3

Scientific Inquiry–Grade 4

2 The student knows and applies the skills and processes of science and technology

Questioning

The student will:

- ask questions about objects, events and processes
- ask questions that can be answered through systematic observations and simple experiments
- distinguish between a question and a hypothesis

SCI EALR 2

2.1

Designing and Conducting Investigations

The student will:

- design and conduct an investigation to answer a question
- keep a notebook that describes observations, procedures and carefully distinguishes actual observations from ideas
- identify and select tools which are appropriate for a given task
- identify and practice safety rules which should be followed during and investigation
- take responsibility for the care of supplies and equipment used in investigations
- repeat experiments to obtain consistent results, ensuring that conditions are kept as similar as possible to previous investigations
- predict an outcome based on experimental data

SCI EALR 2

2.1

Scientific Inquiry–Grade 4

Explaining

The student will:

- support conclusions and interpretations with analysis of the data
- check explanations against scientific knowledge, experience and the observations of others
- offer reasons for their own findings and consider the reasons suggested by others
- draw a conclusion based on a set of experimental data
- consider the subjectivity of human observations (e.g., bias, opinions, preconceptions, experience, limits of the senses) when analyzing data[9]
- recognize when comparisons might be unfair because conditions are not kept the same
- support statements with facts found in books, articles and databases and identify sources

SCI EALR 2
2.1

Modeling

The student will:

- make sketches to aid in explaining procedures or ideas
- choose appropriate materials for making simple mechanical construction
- model objects, events or processes by representing them with concrete objects, metaphors, analogies, or other conceptual or physical contructs

SCI EALR 2
2.1

Scientific Inquiry–Grade 4

Communicating

SCI EALR 2

2.1

The student will:

- understand that clear communication is an essential part of doing science
- use numerical data in describing and comparing objects and events
- critique and analyze own work and the work of other students
- write out instructions that other students can follow in carrying out a procedure
- follow instructions for carrying out a procedure written by other students

Problem Solving

SCI EALR 2

2.2

The student will:

- identify a problem in which science/technology can be used to design solutions
- propose a solution to this problem
- design and perform an experiment to test a solution to an identified problem
- evaluate how well the proposed solution solved the problem

Science in the Social Context–Grade 4

3 The student understands the nature and context of science and technology

Nature of Science

The student will:

- explore the importance of various habits of mind in conducting scientific investigations (e.g., honesty, ethics, openness, skepticism, concern for health and safety)[10]
- given a question or problem, decide whether or not it can be answered by scientific investigation
- know that scientific investigations involve asking and answering a question and comparing the answer with what scientists already know
- propose a reason why observations made by another student may be different from own observations
- analyze the reliability of scientific information from a variety of sources
- use evidence to support or refute a conclusion drawn from a scientific report
- identify an example of an improbable, illogical event in a selected story and point out contradictions[11]
- understand that different findings can lead to new questions to be investigated

SCI EALR 3

3.1

Science in the Social Context–Grade 4

Science as a Human Endeavor

SCI EALR 3

3.2

The student will:

- identify positive and negative effects of new ideas and inventions on people
- although men and women using scientific inquiry have learned much about the objects, events and phenomena in nature, much more remains to be understood
- know that ideas in science change as new scientific thinking, theories and evidence arise
- compare and contrast various accounts of historic milestones in science
- identify how math, science and technology are used in common occupations

Science and Technology in Society

SCI EALR 3

3.2

The student will:

- describe how science and technology are interrelated
- identify a specific need or problem and propose a solution or product that addresses this need, taking into consideration various risk factors
- evaluate the possible strengths and weaknesses of a given solution to the problem
- understand that there are no perfect designs. Every design has a trade-off

Student Learning Expectations and Benchmarks

Science–Grade 5

Catholic Social Teaching

In keeping with the mission of the Catholic school, teachers will infuse Catholic Social Teaching into lessons and assist students in applying this teaching in a developmentally appropriate manner. To facilitate this, we have included a brief statement of each principle that grounds the teaching. The statements are paraphrased from *Sharing Catholic Social Teaching Challenges and Directions* published by the United States Catholic Conference, 1998.

Principles of Catholic Social Teaching

- Each person is sacred.
- Each person is social.
- We care for creation.
- All people have rights and responsibilities.
- We take care of the poor and vulnerable.
- Workers have rights; work has dignity.
- Solidarity is our call; we are the keepers of our brothers and sisters.

Content and Principles–Grade 5

1 The student understands and uses scientific concepts and principles

Physical Science

The student will:	SCI EALR 1
Properties of Objects and Materials	
■ understand how matter undergoes changes of state, in terms of evaporation, condensation, freezing and thawing	1.2
■ know that matter is made up of small particles	
Motion and Forces	
■ describe that nature of forces that change the motion of objects in terms of strength and direction	1.3
■ define terms associated with motion (e.g., speed, acceleration, friction)	
Waves and Energy	
■ know that the sun is the main source of energy for people– energy in fossil fuels come from the sum indirectly because the fuels come from plants	1.2
■ describe how flowing water and air can be used to produce energy in the form of heat and electricity	
■ understand that energy sources differ in their cost and impact on resources	
■ describe how energy is transferred between different forms	
Systems	
■ know that an object with multiple parts is an example of a system	1.2
■ recognize systems in classroom, home, other locations	
■ state the cause-and-effect relationships among components in mechanical or electrical devices	

Content and Principles–Grade 5

Earth and Space Science

The student will:	SCI EALR 1
Geosphere	
■ describe the physical composition of the earth (solid interior, surface, water, atmosphere)	1.2
■ differentiate between processes that slowly change the earth's surface, and those that rapidly change the earth's surface	1.3
Hydrosphere and Atmosphere	
■ understand that clouds and fog are made of tiny drops of water	1.3
■ define a climate	
■ understand that different parts of the world have different climates	
Solar System and Universe	
■ describe the arrangement of the sun, earth, earth's moon and the other planets in our solar system	1.2
■ know that planets change their position against the background of stars	
■ distinguish between revolution and rotation of a solid body (such as a planet)	

Content and Principles–Grade 5

Life Science

The student will:	SCI EALR 1
Structure and Function	
■ arrange several organisms into a classification system	1.1
■ identify and differentiate between the basic functions of various cells	1.2
■ describe how different body structures and organs work together	
Life Cycles, Reproduction and Heredity	
■ distinguish between physical characteristics which are and are not inherited	1.2
Populations and Ecosystems	
■ describe how living and non-living components are interdependent within an ecosystem	1.2
■ describe the effects that a change in a habitat can have on organisms living there	
■ describe the diversity of methods by which organisms meet their needs (e.g., food, shelter, protection, respiration)	
■ understand how substances such as air, water and nutrients are recycled in an ecosystem	
Evolution, Diversity and Adaptation	
■ describe how organisms have changed over time and cite examples of organisms that have not changed greatly over time	1.3

Scientific Inquiry–Grade 5

2 The student knows and applies the skills and processes of science and technology

Questioning

The student will:

- identify questions that can be answered through scientific investigations
- understand that questions lead to the formulation of a hypothesis that guides scientific investigation

SCI EALR 2

2.1

Designing and Conducting Investigations

The student will:

- plan, design and conduct a scientific investigation
- keep a notebook that identifies the question, describes the procedures followed, and accurately records all observation
- understand why one should not go back and change any information in a lab notebook
- identify and select the tools necessary to complete an investigation, including appropriate measuring devices and units of measure (*Math)
- identify controls and variables in an investigation
- describe the function of controls and variables in an investigation
- identify and practice safety rules which should be followed during an investigation
- take responsibility for the care of supplies and equipment used in an investigation

SCI EALR 2

2.1

Scientific Inquiry–Grade 5

Explaining

The student will:

- collect, organize and display data in a variety of forms (*Math)
- develop descriptions, explanations, predictions and models using evidence
- be able to differentiate a prediction from an explanation
- provide causes f and effects and establish relationships based on evidence and logical arguments
- predict an outcome and draw a conclusion based on a set of experimental data
- support statements with facts found in books, articles and databases and identify the sources used

SCI EALR 2

2.1

Modeling

The student will:

- choose appropriate common materials for making physical models
- select an appropriate method of modeling an object, event or process, such a concrete objects, metaphors, analogies, or other conceptual or physical constructs

SCI EALR 2

2.1

Communicating

The student will:

- write out instructions that others can follow in carrying out a procedure
- follow instructions for carrying out a procedure written by other students
- critique and analyze own work and work of other students

SCI EALR 2

2.1

Problem Solving

The student will:

- identify a problem in which science/technology can be used to design solutions
- propose a solution to this problem
- design and perform an experiment to test a solution to an identified problem
- evaluate how well the proposed solution solved the problem

SCI EALR 2

2.2

Science in the Social Context–Grade 5

3 The student understands the nature and context of science and technology

Nature of Science

The student will:

- explore the importance of various habits of mind in conducting scientific investigations (e.g., honesty, ethics, openness, skepticism, concern for health and safety)[12]
- distinguish between questions that can be answered with science and technology and those that cannot
- explain how scientific theory, hypothesis generation and experimentation are interrelated
- analyze the reliability of scientific information from a variety of sources
- use evidence to support or refute a conclusion drawn from a scientific report
- understand that different findings can lead to new questions to be investigated

SCI EALR 3

3.1

Science as a Human Endeavor

The student will:

- know that many people choose science as a career and devote their entire lives to studying it
- know that ideas in science change as new scientific thinking, theories and evidence arise
- describe major scientific ideas and contributions
- investigate careers that involve science

SCI EALR 3

3.2

Science in the Social Context–Grade 5

Science and Technology in Society

The student will:

- describe how science and technology are interrelated
- identify a specific need and propose a solution or product that addresses this need, taking into consideration various risk factors
- evaluate the possible strengths and weaknesses of a given solution to the problem
- describe the impact of the uses of technology on the environment
- given a simple technological device, describe the advantages and disadvantages to the user

SCI EALR 3

3.2

Student Learning Expectations and Benchmarks

Science–Grade 6

Catholic Social Teaching

In keeping with the mission of the Catholic school, teachers will infuse Catholic Social Teaching into lessons and assist students in applying this teaching in a developmentally appropriate manner. To facilitate this, we have included a brief statement of each principle that grounds the teaching. The statements are paraphrased from *Sharing Catholic Social Teaching Challenges and Directions* published by the United States Catholic Conference, 1998.

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- We take care of the poor and vulnerable.
- Workers have rights; work has dignity.
- Solidarity is our call; we are the keepers of our brothers and sisters.

Content and Principles–Grade 6

1 The student understands and uses scientific concepts and principles

Physical Science

The student will:

	SCI EALR 1
Properties of Objects and Materials	
■ understand how to determine physical properties such as boiling point, density and solubility	1.1
■ demonstrate ways to separate a mixture of substances into the original substances using one or more of the characteristic properties	
■ understand that there are over 100 elements that make up all known matter. They can be placed into groups sharing similar properties	1.2
Motion and Forces	
■ use position, direction and speed to represent the motion of an object	1.1
■ know that an object that is not being subjected to a force will continue to move at a constant speed and in a straight line	1.3
■ know that unbalanced forces cause changes in speed or direction of an object's motion	
Waves and Energy	
■ observe waves, and describe wave properties such as wave length, reflection, refraction, transmission, absorbtion, scattering and interference	1.1
■ describe how energy is a property of many substances	1.2
■ understand the difference between renewable and non-renewable energy sources	
■ know that heat moves in predictable ways, flowing from warmer objects to cooler ones until both reach the same temperature	
■ define the law of conservation of energy	
Systems	
■ know that systems include processes as well as things	1.2
■ construct a model that demonstrates changes within a system	

EARTH AND SPACE SCIENCE

The student will:	SCI EALR 1
Geosphere	
■ know how rocks and soils are formed and reformed	1.1
■ know that the earth is a solid sphere with a crust, hot convecting mantle, and dense metallic core	1.2
■ distinguish between constructive forces (deformation, volcanic eruption and deposition) and destructive forces (erosion, weathering)	1.3
■ describe how constructive and destructive forces have changed landforms on earth	
Hydrosphere and Atmosphere	
■ understand the composition of our atmosphere	1.2
■ know how clouds form and how they affect weather and climate	1.3
■ understand that earth's climate is affected by many factors	
Solar System and Universe	
■ describe the main features of our solar system	1.2
■ the sun is a medium-sized star, and that galaxies are comprised of millions of stars	
■ represent the size and distance of objects in our solar system in a physical model	

LIFE SCIENCE

The student will:

	SCI EALR 1
Structure and Function	
■ categorize plants and animals into groups according to similarities and differences in external and internal structures	1.1
■ distinguish between and among cells, tissues and organs	1.2
■ identify the interrelationships among cells, tissues and organs	
■ describe how different body systems interact with and depend upon one another	
■ explore common diseases as a breakdown in the structure and function of an organism	
Life Cycles, Reproduction and Heredity	
■ understand the process of fertilization and cell division in humans	1.2
■ describe the different stages of embryo development	
■ define the terms heredity and genes	
■ know that for offspring to resemble their parents, there must be a reliable way to transfer information from one generation to the next	
Populations and Ecosystems	
■ know that populations consist of all individuals of a species that occur together in a given place and time	1.3
■ understand that all organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment	
■ describe the transmission and conservation of various forms of energy through biological systems	
■ describe the different resource cycles important in an ecosystem (e.g. carbon, nitrogen, water)	
■ explain the role of living and non-living components in an ecosystem	
■ describe similarities and differences of different ecosystems around the world	
■ describe how human societies' use of natural resources has affected different ecosystems	

LIFE SCIENCE

The student will:	SCI EALR 1
Evolution, Diversity and Adaptation	
■ describe specific organisms' adaptations or constancy over time to specific environments	1.3
■ understand that in all environments, organisms with similar needs may compete with each other for resources	
■ understand adaptation as a change in characteristics of an organism as a result of environmental change	

Scientific Inquiry–Grade 6

2 The student knows and applies the skills and processes of science and technology

Questioning

The student will:

- identify questions that can be answered through scientific investigation
- understand that hypotheses can be valuable even if they do not turn out to be true as long as they lead to a fruitful investigation
- recognize questions that may be too broad or ill-defined

SCI EALR 2

2.1

Designing and Conducting Investigations

The student will:

- recognize the different kinds of investigations suggested by a question
- select appropriate tools, strategies, concepts and procedures to construct solutions
- describe a process for collecting information
- read analog and digital meters on instruments used to make direct measurements of length, volume, weight, lapsed time, and temperature
- choose appropriate units for reporting various magnitudes
- identify and control variables in an investigation
- describe variables that cause change
- describe the function of variables in an investigation
- understand that if more than one variable at a time changes, the outcome of the experiment may not be clearly attributable to any one variable
- keep accurate and complete notebook for scientific investigations

SCI EALR 2

2.1

Scientific Inquiry–Grade 6

Explaining

The student will:

- collect, analyze, display and interpret data in a variety of forms (*Math)
- organize information in simple tables and graphs and identify the relationships they reveal (*Math)
- read tables and graphs produced by other students and describe in words what they show (*Math)
- develop descriptions, explanations, predictions and models using evidence
- provide causes for effects and establish relationships based on evidence and logical argument
- be aware there may be more than one good way to interpret a given set of findings
- evaluate information for accuracy, logic, bias and impact

SCI EALR 2

2.1

Modeling

The student will:

- test models by predicting and observing actual behaviors and processes
- make, interpret and use scale drawings, maps and models

SCI EALR 2

2.1

Communicating

The student will:

- communicate scientific procedures, investigations, and explanations orally, in writing, with computer-based technology, and in the language of math and science
- clearly and effectively express and present ideas and situations using both everyday and scientific language appropriate to the audience
- share findings and offer explanations for inconsistencies, limitations and variability in recorded observations from similar investigations carried out at different times in different places and using different techniques

SCI EALR 2

2.1

Scientific Inquiry–Grade 6

Problem Solving

The student will:

- identify a common, everyday challenge or problem that can be addressed by science
- research a variety of sources to understand the nature of the problem
- propose alternative solutions to the challenge or problem
- design an investigation to test the alternative solutions
- evaluate the results of the investigation by comparing and contrasting the multiple solutions

SCI EALR 2

2.2

Science in the Social Context–Grade 6

3 The student understands the nature and context of science and technology

Nature of Science

The student will:

SCI EALR 3

3.1

- know why it is important to keep honest, clear and accurate records
- identify matters that cannot be examined usefully in a scientific way and explain why
- provide more than one explanation for events or phenomena; defend or refute explanation using evidence
- evaluate and challenge (where appropriate) the claims made in consumer product advertisements[13]
- critique presentation that use propaganda techniques (e.g., irrelevant motivators, half-truths, generalizations)[14]
- know that scientific investigations involve collecting evidence, using logical reasoning, and applying imagination in devising hypotheses and explanations to make sense of the world
- describe the relationship between theory and hypothesis

Science in the Social Context–Grade 6

Science as a Human Endeavor

SCI EALR 3

3.2

The student will:

- understand that science requires different abilities, depending on factors as the field of study and type of inquiry
- explore the contributions that people in different cultures have made and continue to make to science and technology
- examine some of the major scientific contributions of different cultures
- describe the impact of the scientific and social context of the period on a historical event in science or technology
- describe the effects of major scientific events on society
- investigate careers that involve science

Science and Technology in Society

SCI EALR 3

3.2

The student will:

- describe a technological discovery that influences science
- describe how science influenced a technological discovery
- consider limitations and constraints when planning designs (e.g. safety, cost, efficiency, appearance)
- know that all technology have effects other than those intended by the design, some of which are predictable, and some which are not

Student Learning Expectations and Benchmarks

Science–Grade 7

Catholic Social Teaching

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Content and Principles–Grade 7

1 The student understands and uses scientific concepts and principles

Physical Science

The student will:

	SCI EALR 1
Properties of Objects and Materials	
■ analyze the physical and chemical properties of objects and mixtures	1.1
■ describe elements, compounds and mixtures as they relate to matter	1.2
■ understand that substances react chemically in characteristic ways with other substances to form new substances. Substances are placed in categories or groups if they react in similar ways (i.e. metals)	
Motion and Forces	
■ describe how different forces affect the motion of an object (in terms of direction and speed)	1.3
Waves and Energy	
■ understand that materials vibrate–wavelike disturbances spread away from the source. Waves move at different speeds in different directions	1.2
■ know that differences in wavelength within narrow range of electromagnetic radiation are perceived as differences in color	
■ relate wave properties such as wavelength, reflection, refraction, transmission, absorption, scattering, and interference to the transmission of sound and light	
■ explain ways in which energy is transferred	
■ know that energy can change from one form to another, although in the process some energy is always converted to heat.	
■ understand that different ways of obtaining, transforming and distributing energy have different environmental consequences.	
Systems	
■ systems involve feedback: output from one part of a system can become the input to other parts.	1.2
■ be able to recognize different types of systems: in the environment, in living organisms, or in technology	

EARTH AND SPACE SCIENCE

The student will:	SCI EALR 1
Geosphere	
■ describe the physical and chemical properties of rocks and soils	1.1
■ earth's interior is hot–heat flow and movement of materials within the earth cause earthquakes and volcanic eruptions and create mountains and ocean basins. Gas and dust from large volcanoes can change the atmosphere	1.2
■ processes seen today (erosion, movement of plates, changes in atmospheric composition) are similar to those that occurred in the past	1.3
■ fossils provide important evidence of how life and environmental conditions have changed	
Hydrosphere and Atmosphere	
■ living organisms have played many roles in the earth system, including affecting the composition of the atmosphere, producing some types of rock, and contributing to the weathering of rocks.	1.3
■ understand the water cycle and its role in the earth's climate	
■ describe the types of bodies of water and their characteristics	
■ fresh water is a threatened resource	
Solar System and Universe	
■ everything near or on earth is pulled toward the earth's center by gravitational force	1.3
■ gravity is the force that keeps planets in orbit around the sun and governs the rest of the motion in the solar system. Gravity alone holds us to the earth's surface and explains the phenomena of tides	
■ earth's history is influenced by occasional catastrophes, such as the impact of an asteroid or comet.	
■ the moon's orbit around earth affects the phases of the moon	

LIFE SCIENCE

SCI EALR 1

The student will:

Structure and Function

- identify organisms based on existing classification systems — 1.1
- Classify organisms based on how they accomplish life processes and by similarities and differences in external and internal structures
- analyze basic structures, components and functions of various cells — 1.2
- identify functions of specialized cells in multicellular organisms (e.g. muscle, nerve, immune-response)
- know that similarities in internal anatomical features can be used to infer degrees of relatedness among organisms

Life Cycles, Reproduction and Heredity

- relate heredity to the process of reproduction — 1.2
- explain the basic principles of heredity and genetics

Populations and Ecosystems

- understand that all organisms rely on two primary food webs–one composed of microscopic ocean plants, and the other composed of land plants — 1.3
- understand how populations are categorized by the function they serve in an ecosystem
- describe how sunlight is the major source of energy in an ecosystem
- describe the factors that limit the number of organisms an ecosystem can support
- understand how the interaction among the senses, nerves and brain make possible the learning that enables humans and other organisms to respond to environmental changes
- investigate the interdependence and similarities of organisms and their physical environment (e.g. mimicry, camouflage)[15]
- explain the impact of human societies' use of natural resources on the quality oflife and health of different ecosystems

Evolution, Diversity and Adaptation

- understand the effects of biological adaptations on species–changes in structure, behavior or physiology–that enhance survival and reproductive success in an environment — 1.3
- understand how extinction, natural selection and species diversity are results of biological evolution

Scientific Inquiry–Grade 7

2 The student knows and applies the skills and processes of science and technology

Questioning

The student will:

SCI EALR 2

- refine and refocus broad and ill-defined questions — 2.1
- identify questions with scientific ideas, concepts and quantitative relationships that guide investigations

Designing and Conducting Investigations

The student will:

SCI EALR 1

- design and conduct an investigation that involves systematic observation, making accurate measurements, and identifying and controlling variables — 2.1
- describe a process for collecting information (*Math)
- use appropriate tools and techniques, including the use of computers, to gather, analyze and interpret data
- choose appropriate units for reporting various magnitudes
- keep an accurate and complete notebook for scientific investigations
- repeat investigations several times to obtain consistent results
- explain the cause and effect of variables within a system
- predict what might be wrong with an experimental design when observations vary widely, and propose and execute design changes to correct these problems

Scientific Inquiry–Grade 7

Explaining

The student will:

SCI EALR 2

2.1

- think critically and logically to make the relationship between evidence and explanations – decide what evidence should be used and account for anomalous data
- recognize and analyze alternative explanations and predictions; remain open to and acknowledge different ideas and explanations, and be able to accept the skepticism of others.
- provide more than one explanation for events or phenomena; defend or refute explanations using evidence
- seek explanations for conflicting descriptions of the same event
- find and read facts and figures in news media, books or databases; make sense of them and construct appropriate lists, tables or graphs[16]
- weigh biases of information sources
- analyze advertisements and technical information to recognize biases and misrepresentation of scientific information

Modeling

The student will:

SCI EALR 2

2.1

- test models by predicting and observing actual behaviors and processes
- correlate behavior of models of objects, events or processes to the behavior of the actual object, event or process

Scientific Inquiry–Grade 7

Communicating

The student will:

- communicate scientific procedures and explanations–communicating experimental methods, following instructions, describing observations, summarizing the results of other groups, telling other students about their investigations and explanations
- clearly and effectively express and present ideas and situations using both everyday and scientific language appropriate to the audience
- write and follow instructions (e.g. algorithms, formulas, flow charts, sketches)
- use a diversity of writing styles to communicate scientific ideas

SCI EALR 2

2.1

Problem Solving

The student will:

- identify a common, everyday challenge or problem that can be addresses by science
- research a variety of sources to understand the nature of the problem
- propose alternative solutions to the challenge or problem
- design an investigation to test the alternative solutions
- evaluate the results of the investigation by comparing and contrasting the multiple solutions

SCI EALR 2

2.2

Science in the Social Context–Grade 7

3 The student understands the nature and context of science and technology

Nature of Science

The student will:

- understand that accurate record keeping, openness, and replication are essential for maintaining an investigator's credibility with other scientists and society
- understand that current scientific knowledge and understanding guide scientific investigations
- question claims made by celebrities outside their area of expertise or based on vague attributions
- understand that scientific knowledge is subject to modification as new information challenges prevailing theories and as a new theory leads to looking at old observations in a new way
- demonstrate how science is an ongoing process of gathering and evaluating information, assessing evidence for and against theories and hypotheses, looking for patterns, and devising and testing possible explanations

SCI EALR 3

3.1

Science as a Human Endeavor

The student will:

- identify different settings in which scientists and engineers work (e.g. college/university, businesses and industries, specific research institutes, government agencies)
- understand that studying some of the individuals who have contributed to science provides further understanding of scientific inquiry, the nature of science, and the relationship between science and society
- use primary sources and interviews to examine the history of science concepts
- describe the effects of major scientific events on society
- investigate how a career of choice uses science and technology

SCI EALR 3

3.2

Science and Technology in Society

The student will:

- design a solution or product that addresses a need and considers factors of an environmental or human problem
- apply a proposed solution to a problem and evaluate the merit of the proposed solution
- compare and contrast scientific inquiry and technological design in terms of activities, results and influence on individuals and society

SCI EALR 3

3.2

Student Learning Expectations and Benchmarks

Science–Grade 8

Catholic Social Teaching

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- Solidarity is our call; we are the keepers of our brothers and sisters.

Content and Principles–Grade 8

1 The student understands and uses scientific concepts and principles

Physical Science

The student will:

	SCI EALR 1
Properties of Objects and Materials	
■ use chemical and physical properties to sort and identify substances	1.1
■ all matter is composed of atoms. Atoms of any element are alike, but are different from atoms of other elements.	1.2
■ atoms may stick together in molecules or are packed in large arrays. Different arrangements of atoms into groups compose all substances.	
■ if the number of atoms stays the same no matter how they are arranged, then their total mass stays the same.	
■ atoms and molecules are perpetually in motion. Motion is affected by the temperature and physical state of a substance.	
■ matter (atoms) can be neither created nor destroyed. Matter is conserved because atoms can rearrange themselves to form new or different substances	
Motion and Forces	
■ know that an object's motion is always judged with respect to another object or point and so the idea of absolute motion or rest is misleading	1.1
■ understand that gravitational forces are exerted by every object on every other objects, and that the force depends on how much mass the objects have and on how far apart they are	1.3
■ analyze moving objects within a system using Newton's Three Laws of Motion	
Waves and Energy	
■ explain how we are able to see light and hear sound, using the concept of light waves and sound waves	1.1
■ understand that the sun's energy arrives as light with a range of wavelengths, consisting of visible light, infrared, and UV	
■ describe how the sun is a major source of energy for changes on the earth's surface	1.2
Systems	
■ any system is usually connected to other systems internally and externally	1.2
■ in a given system, describe how each part interacts and influences each other	

EARTH AND SPACE SCIENCE

The student will:	SCI EALR 1
Geosphere	
■ understand that thousands of layers of sedimentary rocks confirm long history of changing surface of earth and changing life forms whose remains are found in successive layers	1.3
■ compare and contrast the life and environmental conditions within geological time periods	
■ describe how the rock cycle (the formation of new rocks and the recycling of old rocks) results in changes in the solid earth	
■ understand major geological events (earthquakes, volcanic eruptions, mountain buildings) result from the motion of lithospheric plates in the earth's mantle	
Hydrosphere and Atmosphere	
■ understand that heat energy carried by ocean currents has a strong influence on climates around the world.	1.3
■ understand that global patterns of atmospheric movement influence local weather. Oceans have a major effect on climates because water in the oceans hold a large amount of heat	
■ explain how human activities (such as logging, releasing chemicals in the atmosphere) have changed land, oceans, and atmospheres	
■ understand the effects of pollution on the environment	
Solar System and Universe	
■ know that the sun is many thousand times closer to the earth than any other star–light from the sun takes only minutes to reach earth, but light from the next nearest star takes several years	1.2
■ understand that the sun is a major source of energy for phenomenon on earth's surface, such as growth of plants, winds, ocean currents, and water cycle.	1.3
■ understand that the seasons result from variations in amount of sun's energy hitting the surface, due to the tilt of the earth's rotation on its axis and the length of the day	
■ explain the motion of teh earth in relation to the sum, including the concepts of day, night, season and year	
■ know that the sun's gravitational pull holds earth and other planets in orbits, as planets do to their moons	

LIFE SCIENCE

The student will:	SCI EALR 1
Structure and Function	
■ explore standard biological classification systems, including Linnean classification	1.1
■ demonstrate how to use dichotomous keys for classifying organisms, artifacts and objects	
Life Cycles, Reproduction and Heredity	
■ understand what defines a species	1.2
■ distinguish between dominant and recessive traits	
■ describe information that is carried on a gene	
■ understand that an organism's characteristics are determined by both genetic and environmental influences	
Populations and Ecosystems	
■ create a model of the interaction of living and non-living components within an ecosystem	1.3
■ describe examples of competitive or mutually beneficial relationships between organisms within an ecosystem	
■ explore ways in which human societies can balance their need for natural resources with the need to maintain healthy ecosystems	
Evolution, Diversity and Adaptation	
■ identify environmental factors that may determine adaptations or constancy of an organism over time	1.3
■ understand how small differences in parents and offspring can accumulate in successive generations so descendants are very different from ancestors	
■ understand that thousands of layers of sedimentary rock provide evidence for the long history of the earth and for the long history of changing life forms whose remains are found in the rocks	
■ know that more recently deposited rock layers are more likely to contain fossils resembling existing species	
■ understand that individual organisms with certain traits are more likely than others to survive and have offspring in a particular environment	
■ explain why some species become extinct	

Scientific Inquiry–Grade 8

2 The student knows and applies the skills and processes of science and technology

Questioning

The student will:

SCI EALR 2

2.1

- refine and refocus broad and ill-defined questions
- identify questions with scientific ideas, concepts and quantitative relationships that guide investigations

Designing and Conducting Investigations

The student will:

SCI EALR 2

2.1

- design and conduct an investigation that involves systematic observation, making accurate measurements, and identifying and controlling variables
- describe a process for collecting information (*Math)
- use appropriate tools and techniques, including the use of computers, to gather, analyze and interpret data
- choose appropriate units for reporting various magnitudes
- keep an accurate and complete notebook for scientific investigations
- repeat investigations several times to obtain consistent results
- when results from an experiment are ambiguous, redesign the experiment with an improved design and procedures to obtain clearer experiment results
- locate information in various resources as part of an investigation

Scientific Inquiry–Grade 8

Explaining

The student will:

- think critically and logically to make the relationship between evidence and explanations –decide what evidence should be used and account for anomalous data
- recognize and analyze alternative explanations and predictions. Remain open to and acknowledge different ideas and explanations, and be able to accept the skepticism of others.
- interpret and use information in tables and graphs to make comparisons and predictions (*Math)

SCI EALR 2

2.1

Modeling

The student will:

- test models by predicting and observing actual behaviors and processes
- correlate models of the behavior of objects, events or processes to the behavior of the actual object, event or process

SCI EALR 2

2.1

Communicating

The student will:

- communicate scientific procedures and explanations–communicating experimental methods, following instructions, describing observations, summarizing the results of other groups, telling other students about their investigations and explanations
- clearly and effectively express and present ideas and situations using both everyday and scientific language appropriate to the audience
- write and follow instructions (e.g. algorithms, formulas, flow charts, sketches)
- use a diversity of writing styles to communicate scientific ideas
- recognize and critique presentations that lack distinction between fact and opinion

SCI EALR 2

2.1

Scientific Inquiry–Grade 8

Problem Solving

The student will:

- identify a common, everyday challenge or problem that can be addressed by science
- research a variety of sources to understand the nature of the problem
- propose alternative solutions to the challenge or problem–design an investigation to test the alternative solutions
- evaluate the results of the investigation by comparing and contrasting the multiple solutions

SCI EALR 2

2.2

Science in the Social Context–Grade 8

3 The student understands the nature and context of science and technology

Nature of Science

The student will:

	SCI EALR 3
■ understand the importance of skepticism, cooperation, intellectual honesty and proprietary discovery in the operation and ethical traditions of science and technology	3.1
■ understand that it is part of scientific inquiry to evaluate the results of scientific investigations. As scientific knowledge evolves, major disagreements are eventually resolved through interactions between scientists.	
■ critique arguments based on very small samples of data, biased samples or samples for which there was no control	
■ identify statements that are misleading because they are obsolete or general in nature	
■ demonstrate how science is an ongoing process of gathering and evaluating information, assessing evidence for and against theories and hypotheses, looking for patterns, and devising and testing possible explanations	

Science as a Human Endeavor

The student will:

	SCI EALR 3
■ recognize that women and men of various social backgrounds and with diverse talents, interests and qualities engage in the activities of science, engineering and related fields, such as health. Some work in teams, some work alone, but all communicate extensively with others	3.2
■ cite examples in which scientific innovators had difficulty breaking through accepted ideas of their time to reach the conclusions we currently take for granted	
■ describe a recent scientific event that has impacted the quality of life	
■ investigate how a career of choice uses science and technology	

Science in the Social Context–Grade 8

Science and Technology in Society

The student will:

	SCI EALR 3
■ design a solution or product that addresses a need and considers factors of an environmental or human problem	3.2
■ apply a proposed solution to a problem and evaluate the merit of the proposed solution	
■ compare and contrast scientific inquiry and technological design in terms of activities, results and influence on individuals and society	
■ use, consume and dispose of consumer products appropriately	
■ describe some ways in which scientific knowledge and the procedures used by scientists influence the way many individuals in society think about themselves, others and the environment	
■ understand that science cannot answer all questions and technology cannot solve all human problems nor meet all human needs	

Source Documents

These standards are drawn from the following state and national science standards:

Essential Academic Learning Requirements in Science. Washington State Commission on Student Learning, Olympia, WA, 1998.

National Science Education Standards. National Academy Press, Washington, D.C., 1996. p.103-208. (http://www.nap.edu/books/0309053269/html/index.html)

Project 2061: Benchmarks for Science Literacy. Oxford University Press, New York, 1993. (http://project2061.aaas.org/tools/benchol/bolframe.html)

Other States' Science Standards were consulted for specific wording of some objectives. In particular, the following State Standards were helpful:

Ohio Model Competency-Based Science Program. Ohio State Board of Education, Columbus, OH, 1997. (http://www.enc.org/reform/fworks/001628/16283.htm)

Arizona Science Standards. Arizona Department of Education, Phoenix, AZ, 1997. (http://www.ade.state.az.us/standards/science/standard1.htm)

Certain standards are aligned with the Archdiocese K-8 Mathematics Standards; these standards are also references.